solplan review

the independent newsletter of energy efficient building practice

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INSIDE..

In this issue we profile the EPS building system, a new concept in frame construction insulation using precut interlocking expanded polystyrene insulation. This is the first publication anywhere about this product.

We also profile a 2 unit Vancouver townhouse built to explore architectural and engineering solutions to air quality problems in energy efficient houses.

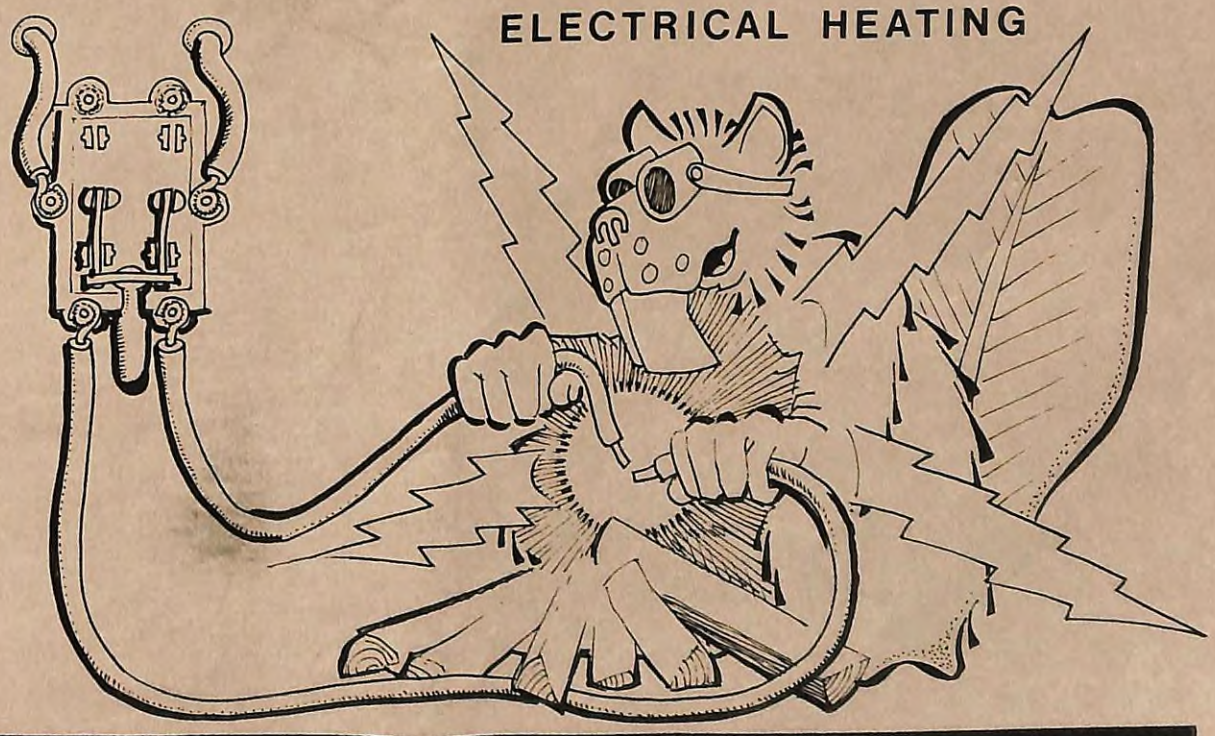
David Blythe continues with an investigation of systems for heating energy efficient buildings, dealing with the concept of comfort and into some detail on electric heating.

Other items include items about developments in the heat recovery ventilator industry, a preliminary schedule of HRV installer courses, information about a new low energy home plan catalogue, new publications, and more.

CONTENTS

From the Publisher 2
High Fashion Energy Efficient Townhoues 3
HRV Update 5
HRV Installer Courses 5
New HRV Products 6
The EPS Building System 7
Letters to the Editor 8
Plan Catalogue 9
R2000 News 9
Heating Systems for Energy Efficient Houses 10
Marketing Ideas 13
New Products: motorized dampers 14
New Publications 15

ELECTRICAL HEATING



FROM THE PUBLISHER

We have noted what could be the first of a number of moves that will see a rationalization of the heat recovery ventilator industry. Air Changer Co., a pioneering manufacturer of Heat Recovery Ventilators, has just been acquired by a major producer of heating and ventilating equipment.

As is the case with most companies in this field, it was a small enterprise active in the creative design and development of the residential heat exchanger into the commercially packaged units we see today.

New product development is a high cost activity. This is especially so in a field where the marketplace has to be created and the public educated concurently. This has been the case with the residential HRV.

Heat exchangers may be common in large commercial construction, but they are a totaly new product at the residential scale. The HRV manufacturers have not only had to develop a technicaly viable and economic product, but also to work at educating the public and contractors. All this takes time and money.

A large market could provide the cash flow and market pressure incentives that would see a quicker refinement of the product. Unfortunately, the HRV market in Canada has not developed quickly enough to justify the number of companies active in the field.

Richard Kadulski

READER SURVEY

This is the 5th issue of SOLPLAN REVIEW This publication was launched to fill a gap in the information system, focusing on issues related to energy efficient building practice. Up to now, we have made a number of assumptions about our audience, and what they would like to see in this publication.

To fill in some of those gaps, and to help us improve SOLPLAN REVIEW, we have circulated a reader survey questionnaire to a number of our readers. If you have received a survey form and have not yet filled it in, please take a few minutes to give us some guidance.

If you did not receive one, but have some thoughts about what we should or should not be doing, please drop us a line and let us know. We would like to be of service to you.

Is the R2000 program to be cut back? Apparently Fiberglass Canada is of that opinion. This would explain why they have launched their marketing campaign promoting the R2000 Fiberglass home. The campaign will shift its emphasis away from insulation sales to selling the concept of energy efficiency.

Selling the concept of the low energy home is what the R2000 program should be involved with. It seems to be slow in getting off the ground.

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HIGH FASHION ENERGY EFFICIENT TOWNHOUSES

The quality of air in well sealed, airtight homes is still a cause of concern to many. Contaminants such as formaldehyde, carbon monoxide, radon gas, water vapour (and resulting moulds and fungi) originate from materials off-gassing, occupants, and appliance use. Resident ill-health, allergies and discomfort are associated with these pollutants.

Detailed research work and monitoring of numerous houses now underway will determine just how valid these concerns are, and what construction techniques can overcome any problems.

Two recently completed townhouse units explore architectural and engineering solutions to air quality problems in energy efficient homes. Elia Sterling and David McIntyre of TDS Ltd. designed and built the townhouses in Vancouver's Kitsilano area.

A number of technical issues were considered in the design and construction of the 1800 square foot units.

1. Limiting of indoor sources of contamination

Standard construction techniques and materials frequently are sources of pollutants. Reduced contaminant levels are achieved by extensive use of chemically stable materials and minimal use of glues, plywood and particle board.

Floors are ceramic tile or hardwood, finished with a natural oil finish containing no additives.

Combustion by-product gases are avoided by using electrical appliances. Sterling points out that combustion appliances cause problems with backdrafting. Several hundred deaths per year in North America are attributed to this problem. A major cross Canada study to evaluate the significance of the backdrafting problem is about to be started.

Sterling suggests that gas fired appliances (especialy stoves) would probably not be approved for indoor use if they were being introduced today.

In accordance with market preference, the townhouses have fireplaces. They are zero-clearance BIS units, equipped with tight fitting glass doors and outdoor combustion air.

2. Limiting contaminants off-gassed from construction materials

Pollution due to acoustical sealant is being evaluated. One unit was built using the standard airtight polyethylene air vapour barrier method, while the second unit uses airtight drywall air vapour barrier.

Acoustical caulking is used regularly to seal polyethylene vapour barriers. Off-gassing from this caulking is not generally considered as a pollution source. Sterling points out that it does have an odour, and is made from a chemical soup of components. There is no information available whether these may be a problem, or whether there might be a health problem. Hydocarbon levels will be monitored.

Little interior grade plywood (which uses a urea formaldehyde resin) is employed. Where particle board is used (mostly in cabinets) the material is complete sealed.

3. Limiting entry of exterior contaminants

Crawlspaces are vented to minimize the entry of radon gas.

Mechanical ventilation equipment and air intakes are located at the roof level to reduce infiltration of other outdoor contaminants. The common location for HRV inlet ports is near the ground, where

dust, fungi spores, auto exhausts and other contaminants tend to settle. This is especially of concern at the location which is on an major traffic artery.

Ventilation equipment includes filtration and heat recovery mechanisms.

4. Control of occupant generated contaminants by mechanical ventilation

The question of what the appropriate ventilation level for a house should be is still uncertain. Studies at various US laboratories, the World Health Organization, and tests assessing UFFI effects in Quebec, suggest that minimum ventilation rates should be .5 air changes per hour. Some suggest that it should be 1.0 air change. The R2000 program requires .5 air changes. How much latitude there is in setting ventilation rates for safer indoor air quality is still unknown.

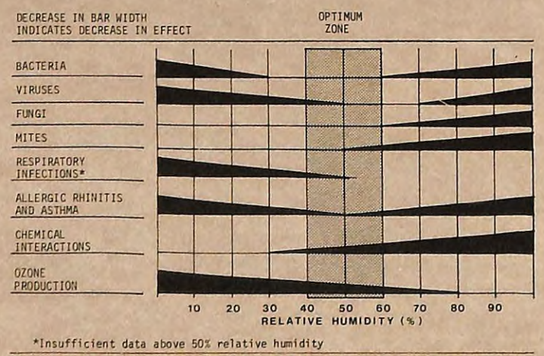
The ventilation rate in these units is set at .5 air changes per hour, increasing to 1.0.

Timer switches are located in the bathroom and kitchen.

5. Control of indoor humidity

Ventilation is controlled by humidistats, located in the centre of the house to automatically double the fresh air supply.

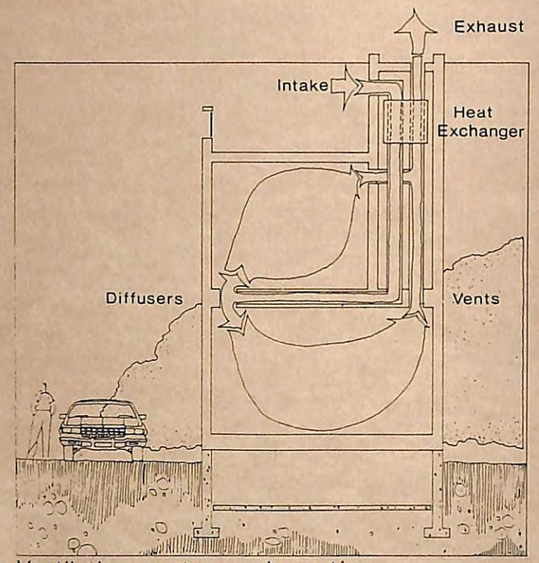
The ability of humidistats to maintain humidity levels within an acceptable level will be monitored.



Humidistats control ventilation to achieve optimum humidity

6. Control of occupant generated contaminants by natural ventilation

The design maximizes the natural cross/stack ventillation through the unit. Operable windows are placed in the bathrooms and kitchens. Some of the larger storage closets on exterior walls have windows as well.



Ventilation system schematic

7. Daylighting of all interior spaces.

The units are profusely glazed to maximize daylighting, as well as to take advantage of the spectacular harbour view available on the site.

The windows are double glazed, vinyl frame units.

Supplementary heating for one unit is provided by an electric heat pump, in a central forced air system. When the house thermostat calls for heat, the heat pump is activated and extracts heat from the exhaust air. This unit is able to supply most of the domestic hot water need of the home (if more is required, the electric hot water tank heating element is activated).

Fresh air is introduced and stale air exhausted through the heat exchanger which is sized to supply .5 air changes per hour

at low speed operation. The recirculating system draws air from the top of the house, filters out particles and mixes diluted cooler outdoor air. The rapid change-over of air ensures even heating and ventilation throughout.

The second unit uses drop-in electric floor heaters, placed at the perimeter of the house near windows. The high volume air recirculation system minimizes stratification of heat within the building. Two air-tight wood burning fireplaces (with outdoor combustion air) could heat the unit by themselves.

The heat recovery ventilator (with aluminum cores) was sized to give a minimum continuous ventilation rate of .5 air changes per hour under normal operating conditions.

Fresh air is introduced at the roof level. Household air is filtered through a 60% high efficiency particulate filter and a permasorb medium that extracts pollutant gases (and odours). The system is capable of cleaning the indoor air 4 times per hour on high speed. This would keep formaldehyde at 1/10 the threshold limit under a worse case condition.

A HOTCAN analysis of the performance indicates that the cost of heating (with electricity) should not amount to more than $ 120. for each unit, which is at the limits of the R2000 program.

Air quality and energy consumption in these two homes, and in other control houses will be monitored to evaluate the effectiveness of architectural and engineering solutions used.

The most obvious benefit for the buyer is the quiet interior - the houses are located in a fashionable part of the city, close to the beach, on a very busy street.

These are at the top end of the market, but they illustrate new building and design concepts, as well as being a part of a research project. They will be monitored for the next 2 years.

The style and design of these units may reflect a West Coast bias. However, with proper modifications, lessons learned from this project can be used in other climatic zones.

The units were built as a speculative project. They were sold at over $280,000 each before completion.

HRV UPDATE

AIR CHANGER CO. CHANGES HANDS

Nortron Industries Ltd. of Mississauga Ont. has acquired the assets of Air Changer Co., a pioneering manufacturer of Heat Recovery Ventilators. It is now a division of Nortron Industries, but will continue under its present operating management.

Personnel and operations will move into Nortron's plant in Mississauga. This facility is presently being expanded from 70,000 to 105,000 sq.ft.

Nortron, and its associate company Broan Ltd. are suppliers of heating amd ventilating equipment.

HRV INSTALLER CERTIFICATION

The preliminary schedule for HRV certified installer training courses has been prepared. These sessions are designed for heating trades personnel. Eligible attendees, after completing the course and an examination are certified to install HRV's.

Installation by certified installers is a requirement of the new CSA standards.

This series of courses begins in December, and will continue until April. The following are preliminary dates and locations for the first sessions. Further dates will be published in the next issue of SOLPLAN REVIEW.

DEC 3/85	HALIFAX	CITADEL INN
	TORONTO	AIRPORT HOLIDAY INN
DEC 4/85	TORONTO	AIRPORT HOLIDAY INN
DEC 5/85	CALGARY	HOLIDAY INN
DEC 10/85	SASKATOON	HOLIDAY INN
DEC 12/85	MONCTON	WANDLYNN INN
JAN 5/85	ST. JOHN'S NF	HOLIDAY INN
	WINNIPEG	HOLIDAY INN
JAN 6/85	OTTAWA	SKYLINE HOTEL
JAN 7/85	EDMONTON	HOLIDAY INN
	CHARLOTTETOWN	WANDLYNN INN

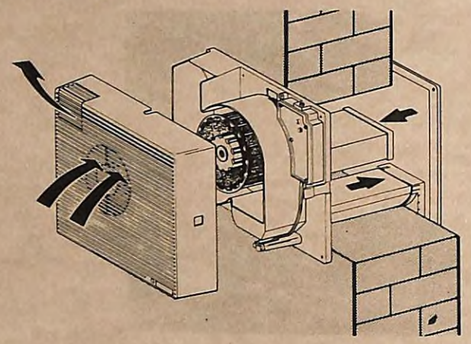
These are PRELIMINARY dates and locations. For confirmation of time and place, contact the Heating Refrigeration Air Conditioning Institute national office (Tel: 416-239-8191), the local EMR-CREO office, or the R2000 coordinator in your area.

HRV UPDATE

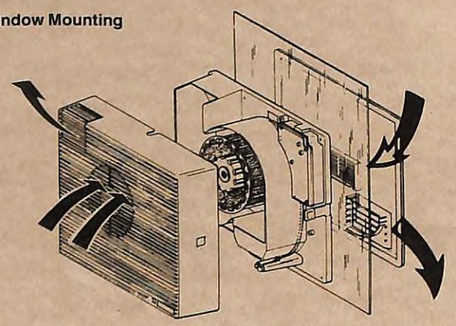
FAN-X-CHANGER WR20

P.M. Wright Ltd. announces that its new 'THROUGH-THE-WALL' unit has received CSA certification. This is a very compact, freeze-free wall mounted heat recovery ventilator. It is rated at 70 cfm with variable speed control, and is supplied with 12" PVC ducts (walls thicker than 13" require extra sleeves).

Wall Mounting



Window Mounting



There is no pre-heat, by-pass or defrost cycle. It is equipped with a capillary-type impeller for energy recovery. A 500 watt re-heater is available as an option to boost the discharge air temperature to a comfortable level (this is necessary in colder climates). The unit has automatic close-off dampers on both outside openings.

Manufacturer's specs are:

Delivery rate:	70 cfm
Power consumption:	43 watts
Unit Dimensions (overall):	
Height	13 7/8"
Width	15 3/4"
Depth (interior projection)	4 5/8"

Necessary window cutout or wall passage: 9 3/4 inch diamter.

The unit was designed for the mobile home, apartment and retrofit market.

NEW FROM NUTECH: LIFEBREATH HRV

Nutech has introduced the new Lifebreath Model 200 and 200FS heat recovery ventilator. This unit replaces the Model 130, which is no longer available. It incorporates design changes suggested by field experience.

New features include:

- a larger heat exchange area
- a greater air flow rate: approximately 175 cfm at .4" external static pressure
- electronic speed control allowing a variable speed
- lower power consumption
- built-in humidistat
- low voltage external speed control terminal (permits connection of remote control switching using bell wire)
- built-in air filters
- hinged access panel

COMING EVENTS

THE HOUSE AS A SYSTEM

A series of seminars targeted for the trades, will be held across the country within the next 3 to 4 months. The object is to pass on the latest technology to building trades. The seminar series is being organized by Energy Mines & Resources. For specific details of time and place, contact the Conservation and Renewable Energy Office (CREO) closest to you.

THE EPS SYSTEM

What happens when a creative mind sets out to improve on building techniques? What if the goal is to make energy efficiency affordable? That was the object of Don Thompson when he started looking at the mechanics of energy efficient house construction.

A new innovative concept in frame construction insulation has been developed which has the potential to revolutionize the housing industry.

The key to the new system, which has been dubbed EPS, is its simplicity. The system, developed by Thermo Structures Inc, use preformed expanded polystyrene insulation panels which are interlocked with preformed lock edge joints to form rigid, air tight panels.

The EPS system incorporates standard frame construction, except that instead of framing the wall first, bracing it, then placing the insulation, the foam is used as a framing table. Full 8 foot height wall panels are grooved at 16" centres, to accept standard 2x6 studs. Doors and windows are cut and framed on site as for standard frame construction.

The foam panels provide the benefits of shop built quality control on the construction site. The studs are simply fitted into each equaly spaced, preformed slot, plates nailed on, and the wall lifted into place. As the foam is dimensionaly stable, even in wet weather, there is little likelyhood of the framing being assembled out of square.

Strutural cross bracing of walls is provided by battens which are placed into preformed channels on the exterior of the wall. These also provide a nailing surface for exterior finishes.

The grooved stud channels ensure an even minimum thickness of insulation on the exterior of each stud, thus avoiding thermal bridging.

The studs are meant to project 2" past the face of the insulation on the interior face, to create a void which is used for locating services. For this reason, it is not necessary to cut into the foam itself.

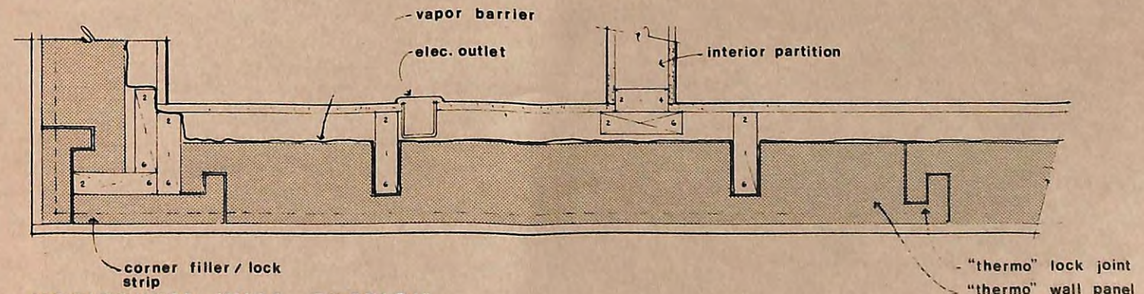
The basic system provides a wall cross section with a nominal R20. Additional insulation can be placed on the interior, to fill the 2" cavity, or by providing additional strapping for greater depth.

Foil facing of the interior face of the foam is being considered. This would improve the thermal resistance of the system, by providing a radiative component. It would also improve the vapour transmission resistance of the foam.

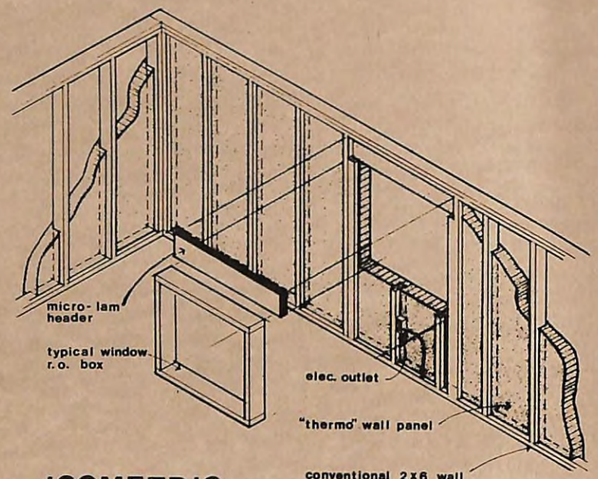
Because of the interlocking joint, the system provides an inherently air-tight enclosure. Use of additional vapour barriers should not be necessary if construction uses the airtight drywall approach. Thus, in one step framing, insulation, and vapour barrier are accomplished.

This system is flexible to use. It can be used without having to make any special modifications to plans for the system, nor does it require any special tools. Only a limited amount of special training is required to familiarize the framing crew with it.

The cost? Presently a price of ± $1.10 per square foot of wall area is being quoted, but it is anticipated that once full scale production is started, the price should drop to $1.00 or less per square foot.



HORIZONTAL WALL SECTION



ISOMETRIC

At the moment, the system is only available in Western Canada, but further distribution and licensing arrangements are anticipated.

This patented product has received CMHC approval, and has already been used on 5 houses in British Columbia and 8 in Alaska (where intial development work was carried out). A 10,000 square foot public library near Anchorage is currently under construction using this system.

Marketing and production arrangements are being finalized now. For the moment, marketing of the system is being handled by Southill Realty Ltd. in White Rock, B.C.

If it sounds that we are enthusiastic about this, it is because we are. Many prefabricated construction systems have been developed over the years. Some of the more succesful ones still are in use, others have proved too cumbersome or complex to justify themselves.

Despite all the innovation, the much criticized stick framing technology continues to be used simply because of its flexibility. The EPS system incorporates the flexibility of stick framing with factory quality control to improve the speed of erection, quality and energy efficiency of houses in a simple way.

LETTERS TO THE EDITOR

Sir,

We believe that you did not fairly portray the efforts of The Society of the Plastics Industry of Canada and its Plastic Film Manufacturers Association to respond to a small number of failures found in the recent CMHC study.

As your article points out, polyethylene like many other building materials (wood, asphalt, etc.) is an organic compound. Organic compounds, unless adequately protected, are subject to degradation from, for example, chemical attack, UV radiation, rot, vermin, etc. Even non-organic materials such as metal are subject to corrosion, a form of chemical reaction.

The new standard for polyethylene vapour barrier being proposed by the Plastics Industry includes specifications for resistance to thermal oxidation (heat degredation) and UV radiation (sunlight), tensile and impact strength plus resin composition. The "new standard" product will meet the requirements of today's housing market and continue to be the best and most appropriate choice as an air vapour barrier. Contrary to your report, the standard calls for UV protection in the product as well as the packaging.

As noted in your article, there are many committees and agencies which have to review and agree on a new standard and the the new standard must find its way into the building codes. Such a review process is for the protection of the public and unavoidable. However, while this process is going on, the industry will be working with the various agencies to ensure that an adequate mechanism is in place to enforce the new standard. It is only with an effective "policing" mechanism that questionable product will be removed from the marketplace.

The response by the Plastics Industry to this potential problem has been responsible. We have worked to find a solution from the first moment we were aware that in some cases there may be the potential for degradation. We believe that your article reflects our industry unfairly and we would appreciate your taking the necessary steps to correct this situation.

J.B. Donaghy, Chairman
PFMA Vapour Barrier Sub-Committee

We are pleased to see that the new standards are going to be more comprehensive than we were led to believe.

Standards generally define minimum criteria that must be met. We hope that individual producers will manufacture product that exceeds minimum requirements. We would also hope that they not wait for the new standards to be enshrined in the building codes before making the new product available. Ed.

PLAN CATALOGUE

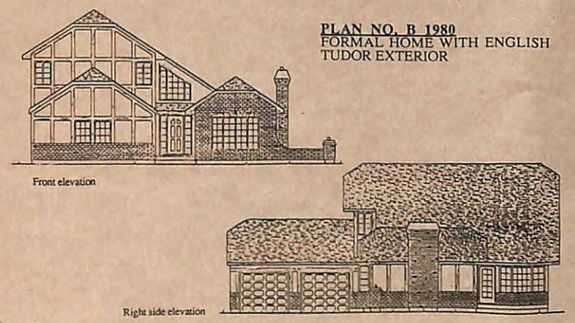
LOW ENERGY HOUSE PLANS

Enercon's Superinsulated Home Plan Catalogue is a collection of 35 designs (prepared by Leland Lange) representing a wide range of house sizes, in a variety of styles. The designs are complementary to typical suburban or rural settings. The plans reflect current trends in house design. They are not unique or particularly outstanding designs.

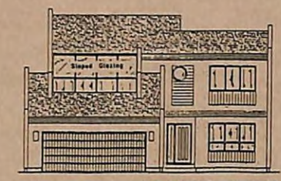
All are designed to take advantage of passive solar heat gains. Some include greenhouses and sunspaces.

Most of the homes included in the catalogue have been built and monitored for performance, and meet or exceed R2000 program requirements.

The graphic presentation leaves something to be desired. Basic floor plans and elevations for each home are presented, but are difficult to read. This makes it difficult to evaluate a design. A builder used to reading blueprints and plan books could 'read between the lines', but an owner-builder may have some difficulty.



PLAN NO. B 1980
FORMAL HOME WITH ENGLISH TUDOR EXTERIOR



Front elevation

PLAN NO. C 2357
CONTEMPORARY DESIGN CAN BE PASSIVE SOLAR FROM FRONT OR REAR YARD

There are no overall dimensions given. A potential purchaser wishing to assess a plan for a property with tight building limits could have difficulty.

Working drawings for the houses in the catalogue are available. A 5 set builder's package costs $325-375. The blueprints include all the extra information required to build a superinsulated airtight house, including complete information for installing a heat recovery ventilator, and total mechanical system layout.

The plan catalogue is available for $15.00 from:

Northern Scientific Inc.
P.O. Box 917
Regina, Sask. S4P 3B1

R2000 NEWS

To speed up processing of applications, and plan approvals, the R2000 program will rely on a group of plan checkers. A number of potential consultants have attended training workshops earlier this fall.

The workshops were held to train and approve an initial group of consultants capable of accurately doing R2000 design analysis to maintain the credibility of the program.

Those who passed the examination will be qualified to evaluate plans. Once the system is operational, plan approval should be handled much quicker.

If an increasing number of new housing is to be built as R2000 ID houses, the paperwork will have to be minimized. The larger pool of plan checkers should, in theory, mean that this stage of the paper work should be speedy.

HEATING SYSTEMS FOR ENERGY EFFICIENT HOUSES

By David Blythe

The last issue of SOLPLAN REVIEW gave an overview of heating systems for energy efficient houses. Remember that installation costs, operating costs, reliability, maintainability are factors to consider when choosing a heating system for your home. This article deals with the concept of comfort and gets into detail on electric heating systems.

COMFORT

The major consideration for homeowners, particularly owners of energy efficient homes, is the comfort of the house. Comfort is affected by overall system performance including the efficiency with which heat is distributed throughout the house.

The concept of comfort is more complicated to quantify than one might at first believe. There are three basic mechanisms of heat transfer: conduction, convection and radiation. In all cases, heat moves from the hotter area to the cooler.

Conduction is the transfer of heat energy through a solid. Heat energy is conducted as long as there is a temperature difference. A pot on a stove is heated because it is in contact with the electric resistance elements.

Convection is the transfer of heat energy by moving a fluid, typicaly air. A baseboard heater warms the air in a house because air flows upwards through the baseboard. The air surrounding the fins in the element is heated by conduction but rises because its density is reduced at the same time. This process occurs continuously and very soon a definite flow develops through the unit. A baseboard heater is often called a convector.

Another example of convection heat loss occurs when our skin is cooled down by a breeze. Heat loss increases rapidly as the wind speec increases. This is why in summer, fans are used to provide cooling.

Radiation is the direct transfer of energy by electromagnetic waves from a hotter object to an object at a cooler temperature. Most people are familiar with the heat received from the sun or a wood fire - both are examples of radiant heat transfer.

Thermal comfort for individuals is a result of the cumulative effects of all three types of heat transfer. The warmth received from the sun can be negated by a strong wind reducing the temperature of one's skin.

The average temperature of all the surfaces in a room is called the mean radiant temperature. This can affect thermal comfort as much as the air temperature. Keeping surface temperatures inside the house warm generally improves interior comfort. The discomfort often perceived as a "cold draft" from a large window is usually a result of radiant heat loss from the occupant to the cold window.

Low energy homes are comfortable because wall surfaces are generally warmer and allow thermostats to be reduced to a relatively lower setting, which incidentally also increases performance economy.

ELECTRIC SYSTEMS

In areas with abundant sources of secure low cost electricity (especially hydro electricity) it offers a viable heating-energy option for homes with low heat requirements.

Electric systems require no vents, combustion air, or storage, thus making it easier to tighten up a house.

BASEBOARDS

Electric baseboards are considered to be 100% efficient. All units available in Canada are made by two manufacturers (General Electric and Chromalox), but are sold under many trade names.

Baseboards are rated at 120V, 208V, 240V, 347V, and 600V and are generally available in the following sizes: 300W, 500W, 750W, 1000W, 1250, 1500, 1750W, 2000W, 2250W, 2500W. At 240V, suggested list price ranges from $45.00 for the 300 watt unit to $118.00 for the 2500 watt. Baseboard units are often sold at significant discounts.

Floor drop-in heaters and kick space heaters are also available for use in areas where typical baseboard units are not appropriate.

HEATING SYSTEMS FOR ENERGY EFFICIENT HOUSES

These units are available in sizes from 350 watts to 2000 watts and are usually two to three times as expensive as the basic baseboards. Kickspace heaters come with integral fans to distribute heat whereas fans are optional for drop in heaters.

Wall insert heaters are also available for use in entry ways where high heat loss may occur. Sizes are available from 500 watts to 2000 watts and prices are generally twice that of typical baseboards.

Baseboard units generally provide a good match between heat loss and heater size for individual areas. Thermostats are required for each zone or room with a closeable door. This increases system efficiency and reduces operational costs. Some baseboards have integral thermostats, but these are generally not as effective as units with separate thermostats located on an adjacent wall.

ELECTRIC FORCED WARM AIR FURNACE

These units are good for either retrofit (conversion from oil, gas, wood) or for new construction. A single central thermostat reduces system efficiency. Generally available in sizes of 10kW to 30kW (10, 15, 18, 20, 24, 27, 30). Prices start at about $500 for a 10 kW unit and rise to about $700 for a 30 kW unit.

A 10 kW unit consists of two 5kW elements which are controlled in sequence to reduce input current. The second element may also be connected to an outdoor thermostat so that in spring and fall only a small heat source is used. 3-5kW heaters will soon be on the market. These will be welcomed as appropriately sized units for energy efficient homes.

There are four major manufacturers of electric furnaces in Canada (Chromalox, FPE, Nortron, Lennox) and an additional 6-8 smaller companies.

Total installed costs are similar to gas forced air systems once the price of the duct work is accounted for. Although the size of electric service may need to be increased, this should not be a problem with low energy homes, and is offset by no additional hook-up charges for alternate fuels.

Ductwork must be designed professionally as the incremental increase in the temperature of air passing through the heating element is not as high as with a gas fired furnace (20-30°F lower). Registers must be positioned to take into account these cooler temperatures, or they may actually cool the occupants (and decrease comfort).

HOT WATER BOILERS

As with other electrical heating equipment, these units have been manufactured for over 20 years by many manufacturers. They can replace older fossil fuel fired boilers or be installed in new homes. Typical output sizes available are 9kW, 10kW, 15kW, 18kW, 20kW, 25kW, 30kW. These result from various combinations of 4.5 and 5kW heating elements. For the smaller units, the last 4.5 or 5kW element can be controlled by an outdoor thermostat.

A new 7kW unit for radiant water systems has just been introduced.

These units generally sell in the range of $800 to $1100 each. Zone control increases system efficiency but adds to costs of the total system. Most homes would require two to five zones. Maintenance costs must be considered for pumps and valves after a few years of operation.

HEAT PUMPS

These devices have been used for many years, mainly in commercial buildings and air conditioning. New smaller residential units are now available. For areas requiring heating and cooling, a heat pump with reverse cycle capacity will provide both.

Heat pumps generally cost $5000 to $6000 to install. Maintenance can be a significant cost after a few years of operation and requires skilled tradespeople.

In colder climates, heat pump efficiency (which in theory can exceed 200%) will be reduced to a point where auxiliary heating may be required.

A number of models exist.

HEATING SYSTEMS FOR ENERGY EFFICIENT HOUSES

New units which combine space heating, domestic hot water, and ventillation (heat recovery) are being developed. They promise to provide new breakthroughs.

RADIANT CEILING HEATING SYSTEMS

Electric radiant ceiling heating is one of the most economical heating systems. This system is controlled by individual room thermostats, similar to baseboard heaters. Heat transfer is ususally 50% by radiation and 50% by conduction. Very uniform room temperatures are achieved with this type of heating. Comfort is enhanced because of low heat densities, usually in the range of 10-20 watts per square foot (100-200 watts per square meter).

When installed properly and under normal operating conditions, these systems are maintenance free.

Rooms with high heat loss due to large window areas, high infiltration, or small ceiling area may require a supplementary heat unit.

Two ypes of systems exist: cable sets or plastic encased element webbs. Cable sets consist of thermoplastic insulated wires operating at 120V, 208V or 240V. Cable sets are available in definite lengths and range from 200W to 5000W in either 100 or 200W increments.

Cable sets require 2 layers of gypsum board (or to be embedded in a concrete topping). New radiant heating systems are now available which can be stapled directly to the joists or trusses and require only one layer of gyproc as a cover. CSA approved systems such as ESWA (SOLPLAN REVIEW #1, Product Profile) are much faster to install than cable system and offer reduced material costs.

Costs for cable systems can vary from $20 to $200 for wattages from 200W to 5000W. The length of cable corresponding to these wattages is 90 to 1800 feet (approximately 2.5W per foot). This cost is equivalent to 4-10cents per watt (higher costs for small wattage cables).

Systems like ESWA can be supplied for an equivalent price of 15-20 cents per watt.

Again, a large number of suppliers are available (Chromalox, FPE, GE, General Wire & Cable). These systems must be professionaly designed to ensure matching of elements and cables to room/area heat loss.

HEATING SYSTEMS

The heating system is an integral part of the low energy home. Because of the low annual heating bills it reduces the 'payback' or 'return on investment' of costly heating systems. Operating costs and capital costs are two separate factors that should be considered along with comfort considerations when making a system selection.

The more efficient a home is in reducing energy needs, the more likely a costly high efficiency system will not present a good payback potential, when considering energy savings.

High cost systems should only be considered where superior comfort or a combined system is involved (space heating-domestic water-ventilation).

HEATING SYSTEM COST COMPARISIONS

Generally accepted comparative costs for system installation (per area of heated space)

TYPE (all electric systems)	PRICE (approx. range)
BASEBOARD	$0.45 - 0.65/sq.ft.
FORCED AIR	$0.75 - 1.10/sq.ft.
RADIANT CEILING	$1.00 - 1.40/sq.ft.
HOT WATER BASEBOARD	$1.35 - 1.65/sq.ft.
RADIANT HOT WATER	$1.75 - 3.50/sq.ft.

CONVERSION FACTORS:

To convert from kW (kilowatts) to BTU's/hour, use the following:

1 kW = 3412 BTU/hour

A heat loss of 1 kW for 1 hour equals one kilowatt hour (kwh). This equals 3412 BTU.

MARKETING IDEAS

Most small builders (competent at what they do best: building) have problems in marketing their services. We would like to present a number of ideas that may be of help. We welcome reader contributions - what did or did not work for you? (We are prepared to keep contributions anonymous).

Word of mouth is by far the best form of advertising. A satisfied customer is worth considerably more than any paid advertising campaign. However, there are times it is necessary to expand the potential pool of customers, to get your name out in front of a new public.

Paid advertising in magazines or newspapers is expensive, and no matter what the advertising salesman may say, it may not place your name in the market segment you are looking for. There are alternatives.

Homeshows are held regularly in all regions of the country. They attract the prime audience for the builder - those active in the market for a new house or renovations. Generally, they are dominated by product distributors. Seldom do small builders or sub-trades participate.

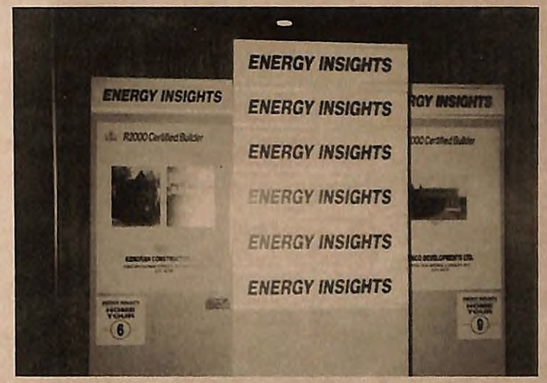
A display at such a show can be expensive, and beyond the capabilities of the smaller contractor or consultant. However, if several builders or suppliers cooperate on a joint display it provides an affordable alternative.

THE ENERGY INSIGHTS EXAMPLE

To address the marketing need for small suppliers and builders, Eneready Products Ltd., a Vancouver ventilation equipment company coordinated a joint exhibit at the Fall '85 Vancouver Home Show. The promotion included a 900 sq.ft. exhibit which included space for 11 supplier and service company exhibits (averaging 50 sq.ft. of space each), a common area for hand out material, plus space for signs for builders.

8 small builders and 4 professionals participated with poster presentations. Eneready coordinated the display material for these with a signmaker.

Posters were standardized (each 22"x28"). The posters contained basic identifying information (name, address,



phone) plus any desired caption (specialty, R2000 status, etc), and one or two 8x10 colour photos of a recent project. At each poster, an acrylic card holder held each company's business card.

This "gallery of builders" offered good exposure for the builders, at a nominal cost. This idea also is suitable for subtrades. A common question members of the public have is where to find competent trades people. The reverse is also true - the trades would like to get exposure to potential customers, but seldom have the opportunity.

An added feature was a do-it-yourself home tour on the last day of the show. Some of the builders held an open house at a house during designated times. A list of addresses and location map was prepared, and made available at the home show. The builder's posters had an identifying sign attached, indicating the contractor's participation.

As not all the homes were complete, it offered an opportunity for people to see an energy efficient house during construction. In one case, a pressure test was scheduled during the open house period.

This coordinated approach generated much serious traffic for the small participating builders. It was also specialy promoted by the show organizers, who saw the potential of the unique exhibit.

The net cost for each builder's poster presentation was under $200 for a complete, professional presentation. This idea could be used in any city.

NEW PRODUCTS

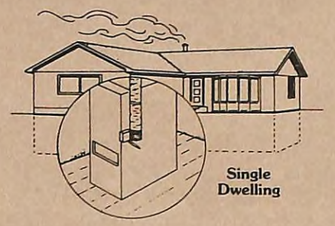
MOTORIZED FRESH AIR DAMPERS

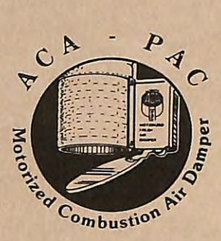
Combustion appliances require fresh air. Traditionally, this means a duct (generally without any dampers) is brought into the general vicinity of the furnace to ensure a continuous source of fresh combustion air. It also means that a hole must be opened in an exterior wall.

Hoyme Manufacturing Ltd. of Camrose, Alberta has developed a motorized combustion air damper. It is connected to the furnace thermostat, ensuring that the damper will open any time the furnace is called on to provide heat.

The damper opens by gravity. In the event of a power failure, the damper will open.

The list price is $150.00 The unit has Canadian Gas Association approval, and is accepted in the prairie provinces, Ontario, and the NWT. (It has not been approved yet for use with gas fired appliances in B.C.).





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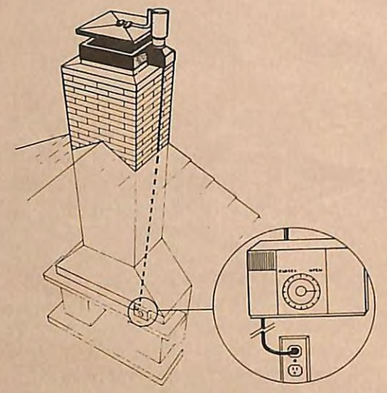

FIREPLACE CHIMNEY POWER CAP

A fireplace in most houses is not used very often. Sealing the fireplace opening is a major problem in keeping the house tightly sealed.

A fireplace chimney cap that provides a positive seal over a flue has been developed by Hoyme Manufacturing Ltd. The cap is a made from heavy metal, and designed to fit on top of round or square chimneys. It is operated by an electrically driven (standard 110 volts) hydraulic cylinder.

However, if the chimney has a rain cap, this power cap may not necessarily be attached easily. In the event of a power failure it may not be possible to use the fireplace as the unit is electrically activated.

The chimney cap reinforces the action of the fireplace damper (which seldom is perfectly tight). It also keeps the flue warmer, making lighting a fire easier.

This unit is of some merit for colder climatic zones, and houses with fireplaces where they are seldom used.

Do you have an innovative building idea? an interesting energy efficient design? technical questions you want answered?

Do you need more information about any item in this issue? Would you like to follow up any issues discussed? Let us know.

NEW PUBLICATIONS

Accessibility Requirements in the National Building Code of Canada 1985 (Building Practice Note 53, National Research Council of Canada)

New requirements to facilitate the use of buildings by persons with physical disabilities are included in the 1985 edition of the National Building Code. These requirements apply to public and commercial buildings. However, as 10% of the population has some form of disability, it is likely that most builders will encounter someone requiring easy access to their home.

The criteria for disabled access that apply to public buildings are equaly relevant at the residential scale. This is especially true when you consider that age or accident occur throughout the population, anyone can be temporarily handicapped.

This Building Practice Note provides excepts from the new code requirements, along with explanatory diagrams and discusses their significance. A worthwhile document, available free from the National Research Council.

The Difference Between a Vapour Barrier and an Air Barrier (Building Practice Note No. 54, National Research Council)

Moisture problems in walls have been atributed to two mechanisms: vapour diffusion and air leakage, specifically the deposition of moisture by moist air exfiltrating through the building envelope. While significant technology related to vapour difusion control exists, there is very little technology available related to air leakage control for the repair of existing building envelopes and virtualy none for the design and construction of the envelope of new buildings.

In the last issue of SOLPLAN REVIEW we briefly presented a definition of the air barrier and how it differs from a vapour barrier. Since then, this document has been published by the National Research Council. It presents in greater detail a definition of the air barrier, outlines the performance requirements, and examines the application of the theory to several typical commercial constructions. This application could provide a functional and durable air barrier within the building envelope.

The paper is available free from the National Research Council of Canada.

A worthwhile document for anyone wishing to pursue this issue.

ALTERNATE ENERGY EFFICIENT CONSTRUCTION METHODS

In the April-May issue of SOLPLAN REVIEW we presented an overview of some construction techniques used in energy efficient building. A reader has brought to our attention that a statement made about the position of the vapour barrier (when located within the wall) could be misinterpreted.

We mentioned that the vapour barrier can be up to 1/3 of the way into the wall (measured from the interior). The correct expression should be that the vapour barrier can be up to 1/3 of the wall's total R-value into the wall. The "one third-two thirds rule" has been a useful rule of thumb, but this rule refers to the R-values of the wall, not the measured distance into the wall.

This is critical if a combination of insulation materials is used. An insulation board such as polyisocyanurate (Thermax™) has considerably more 'R-value' per inch of thickness than fiberglass batt.

What must be stressed is that this rule of thumb is only a guideline, not an absolute rule, as the acceptable position of the vapour barrier (if not on the interior face of the wall) depends on the type of insulation, the home's relative humidity, and local climate conditions.

The R2000 program checks for vapour barrier details, and requires that in areas with over 7000 degree days (°C) the vapour barrier must not have more than 3/4 of the total R-value on the cold side. In areas with over 8000 degree days (°C) the vapour barrier must have more than 4/5 of the total R value on the cold side.

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NEXT ISSUE:

* Insulation products: are you realy getting what you pay for? How accurate are the R values quoted by manufacturers?

* A look at the R2000 program: where is it going? What is it's impact on the housing industry?

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READER RESPONSE SERVICE

Would you like to receive more information about some of the items we have discussed in this issue of SOLPLAN REVIEW?

As a service to our readers, we will obtain more information or forward your name to any of the companies/institutions whose products or activities have been discussed in this issue.

- ☐ HRV Installer coures
- ☐ Fan-X-Changer WR20
- ☐ Lifebreath
- ☐ EPS Building System
- ☐ Northern Scientific Inc.
- ☐ Hoyme Manufacturing Ltd.
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